(Knowledge for Development)

KIBABII UNIVERSITY

(KIBU)

UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS
YEAR THREE SEMESTER TWO EXAMINATIONS

FOR THE DEGREE OF BACHELORS OF SCIENCE (COMPUTER SCIENCE)

COURSE CODE: CSC 324

COURSE TITLE: PRINCIPLES OF PROGRAMMING LANGUAGES

DATE: 6/09/2022   **TIME:** 9 A.M. – 11.00 A.M.

INSTRUCTIONS TO CANDIDATES

ANSWER **QUESTION ONE** AND **ANY OTHER TWO QUESTIONS**

QUESTION ONE (COMPULSORY) [30 MARKS]

a. Explain any TWO reasons of studying concepts of programming languages. **[2 marks]**

b. Why is it necessary for one to understand the history of programming languages before learning the principles of programming languages? **[2 marks]**

c. Discuss the following concepts in relation to principles of programming languages:

    i. Programming domain **[2 marks]**

    ii. Language evaluation criteria **[2 marks]**

    iii. Language design **[2 marks]**

d. How does the execution of a machine code program on a von Neumann architecture computer occur? **[3 marks]**

e. Explain TWO programming language deficiencies that were discovered as a result of the research in software development in the 1970s? **[2 marks]**

f. Explain briefly the THREE fundamental features of an object-oriented programming language? **[3 marks]**

g. Describe the two levels of use of operational semantics. Why can machine languages not be used to define statements in operational semantics? **[4 marks]**

h. Some programming languages—for example, Java —have used the semicolon to terminate statements, while Pascal uses it to separate statements. Which of these, in your opinion, is most natural and least likely to result in syntax errors? Justify your answer. **[4 marks]**

i. Many contemporary languages allow two kinds of comments: one in which delimiters are used on both ends (multiple-line comments), and one in which a delimiter marks only the beginning of the comment (one line comments). Discuss the advantages and disadvantages of each of these with respect to design criteria. **[4 marks]**

j. Languages continually evolve. What sort of restrictions do you think are appropriate for changes in programming languages? Compare your answers with the evolution of C++. **[4 marks]**

QUESTION TWO [20 MARKS]

a. What is the meaning of lexeme and token as used in programming?   **[2 marks]**

b. Explain the role and the use of in a programming language :

   i.   Variables   **[2 marks]**

   ii.   User-Defined Types   **[2 marks]**

   iii.   Pointers   **[2 marks]**

c. Conventionally, all language developments require mastery of grammar or syntax. In which form is the programming language syntax commonly described?   **[3 marks]**

d. Discuss the following natation's or formal way of descripting the syntax pointing out their respective evaluation criteria;

   i.   Operational Semantics   **[3 marks]**

   ii.   Axiomatic Semantics   **[3 marks]**

   iii.   Denotation Semantics   **[3 marks]**

QUESTION THREE [20 MARKS]

a. Why is it useful for a programmer to have some background in language design, even though he/she may never actually design a programming language?   **[2 marks]**

b. Explain the meaning of a left-recursive grammar and an ambiguous grammar.   **[4 marks]**

c. What is the difference between total correctness and partial correctness with regard to loop termination?   **[4 marks]**

d. Explain the preconditions and post-conditions of a given statement mean in axiomatic semantics.   **[2 marks]**

e. The two mathematical models of language description are generation and recognition. Describe how each can define the syntax of a programming language.   **[4 marks]**

f. Using the grammar, show a parse tree and a leftmost derivation for each of the following statements: A = A * (B + (C * A))   **[4 marks]**

g. What are the reasons why using BNF is advantageous over using an informal syntax description?   **[2 marks]**

QUESTION FOUR [20 MARKS]

a. Give a definition of two-way and multiple-way selectors.   [3 marks]

b. What are the different grammar symbols for formal languages?   [2 marks]

c. Describe briefly the three approaches to building a lexical analyzer.   [3 marks]

d. Why are named constants used, rather than numbers, for token codes?   [2 marks]

e. Describe the complexity of parsing algorithms and explain the two distinct goals of syntax analysis?   [4 marks]

f. Explain the concept of **type checking**, **type compatibility** and **strong typing** as used in the study of programming languages.   [6 marks]

QUESTION FIVE [20 MARKS]

a. Differentiate between declarative and imperative programming approaches or style with examples in each case.

[4 marks]

b. What TWO things must be defined for each language entity in order to construct a denotation description of the language?   [2 marks]

c. Compare the string manipulation capabilities of the class libraries of C++, Java, and C#.

[3 marks]

d. Discuss THREE key feature that differentiate object oriented programming approach from procedure oriented programming approach.   [3 marks]

e. Using the structures parent(X, Y), male(X), and female(X), write a structure that defines mother(X, Y).   [4 marks]

f. Discuss any three criteria that is used when evaluating a programming language and differentiate between total correctness and partial correctness.   [4 marks]